

CLAIMS

1. A method of polishing and/or brightening a magnesium or magnesium alloy surface comprising the steps of:

- 5 i) polishing the surface, and
 ii) passivating the polished surface.

2. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 1, wherein the method further comprises an initial step of pre-treating said surface to remove surface contaminants.

10 3. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 1 or claim 2, wherein said pre-treating step comprises chemically etching said surface and/or degreasing said surface.

4. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 2 or claim 3, wherein surface contaminants are removed prior during the pre-
15 treatment step by contacting said surface with one or more degreasing components, such as sodium hydroxide.

5. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 3, wherein said chemical etching component is nitric acid solution and/or phosphoric acid.

20 6. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of claims 1 to 5, wherein the polishing step is carried out by a chemical polish and/or electro-chemical polish while said surface is immersed in a polishing composition.

7. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
25 claimed in claim 3, wherein said chemical polish and/or electro-chemical polish removes surface layers and/or reduces microscopic high points from the surface.

8. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein polishing step is carried out by immersing said surface in a bath of one or more of the following components; a phosphoric acid solution,
30 monopropylene glycol, ethylene glycol, and nitric acid.

9. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said electro-chemical polish is a galvanic electrolysis.

10. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said electrochemical process further includes the supply of an external voltage to said surface.
11. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
5 claimed in any one of the preceding claims, wherein during said electro-chemical polish an electrolyte anti-stagnation means is utilised or an AC voltage is applied to the electrolyte containing said surface.
12. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
10 claimed in any one of claims 5 to 11, wherein said electrolyte anti-stagnation means is an electrolyte stirrer and/or an ultrasonic wave generating means.
13. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 12, wherein said polishing step is followed by an intermediary wash removing at least some of the chemical and/or electrolyte solution from said surface.
14. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
15 claimed in claim 13, wherein said intermediary wash is carried out in a composition containing monopropylene glycol and/or ethylene glycol.
15. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said polishing step and/or said intermediary wash is followed by an alkaline wash.
- 20 16. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 15, wherein said alkaline wash is carried out in a composition containing sodium hydroxide.
17. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
25 claimed in claim 15 or claim 16, wherein said alkaline wash substantially neutralises acids and/or substantially removes Aluminium, Manganese or Zinc from said surface.
18. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said passivating step provides a substantially corrosion resistant and/or water insoluble surface coating or film.
19. A method of polishing and/or brightening a magnesium or magnesium alloy surface as
30 claimed in claim 18, wherein said substantially corrosion resistant and/or water insoluble surface coating or film is a phosphate salt coating or film.
20. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 18 or claim 19, wherein said passivating step voltage is varied to alter said substantially corrosion resistant and/or water insoluble surface coating or film thickness.

21. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein an inorganic material coating or sealer is applied to said substantially corrosion resistant and/or water insoluble surface coating or film.

5 22. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 21, wherein said inorganic material coating or sealer is substantially transparent and/or substantially provides corrosion protection and/or at least provides some protection from mechanically induced damage.

10 23. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 21 or claim 22, wherein said inorganic material coating or sealer is a silicon based composition, such as a disodium metasilicate, and a polyacrylamide coagulant in de-ionised water.

15 24. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said passivating step and/or said inorganic material coating or sealer step is followed by a surface drying step.

25. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims including the pre-treatment steps of:

- a. immersing the surface in an iron based solution,
- b. activating said surface with said iron based solution, wherein said iron based solution is reduced to thereby deposit iron on said surface,
- c. etching said surface with an etch composition to modify the activated surface layer,
- d. stripping iron deposits from said surface with an iron removal composition, and
- e. washing said surface to substantially remove compositions remaining on said surface.

26. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 25, wherein said activator is a solution selected from the following; ferric chloride, hydrochloric acid, ammonium bifluoride, and ammonium bromide.

27. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 25 or claim 26, wherein said etch composition is selected from the following; ferric chloride; ferric chloride and phosphoric acid solution, or a reduced solution of ferric chloride and phosphoric acid.

28. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim any one of claims 25 to 27, wherein said iron removal composition is selected from the following; nitric acid and sodium borate in solution, or nitric acid and phosphoric acid in solution.

5 29. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of claims 25 to 28, wherein said step of washing said surface is carried out with a water wash or an alkaline wash.

10 30. A method of polishing and/or brightening a magnesium or magnesium alloy surface substantially as hereinbefore described and with reference to any one of the accompanying drawings.

31. A magnesium or magnesium alloy surface polished or brightened according to the method substantially as hereinbefore described and with reference to any one of the accompanying drawings.